



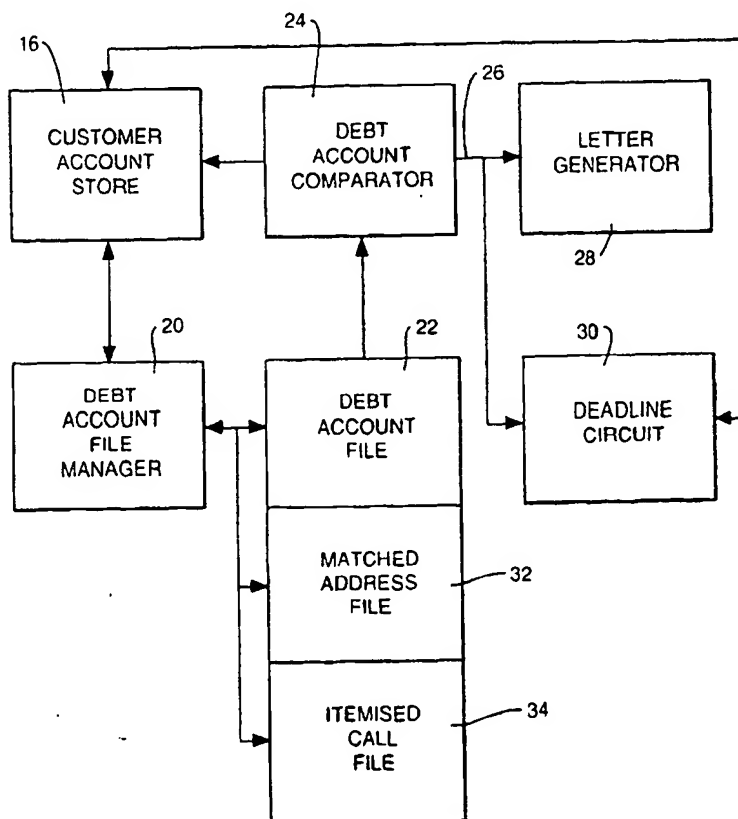
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(54) Title: FRAUD PREVENTING METHOD FOR A COMMUNICATION NETWORK

(57) Abstract

There is described a fraud detection system for use with a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a settable indicator which when set indicates that the account is a debt account having a predetermined debt status the fraud detection system comprising first means responsive to a debt account for accessing, in use, the database for selecting a customer account, for obtaining a group of called numbers associated with the debt account and a group of called numbers associated with the selected customer account, for comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the selected customer account is a probable fraudulent-application account.



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Fraud preventing method for a communication network

This invention relates to debt management in a communications network and particularly, but not exclusively, to the detection of customer accounts obtained by fraud.

5 In a modern communications network such as the United Kingdom public switched telephone network (PSTN), the billing system is a sophisticated set of functions including Debt Management, which is a process to progress the collection of overdue payments including the issue of
10 standard letters. Such a billing system is described in more detail in the article at pages 273 to 278 of British Telecommunications Engineering, Volume 11, Part 4, January 1993.

The concern of the present invention lies principally
15 in combatting fraudulent applications for telecommunications services, which will usually be telephone service.

According to a first aspect of the present invention there is provided a fraud detection system for use with a
20 communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a
25 settable indicator which when set indicates that the account is a debt account having a predetermined debt status; the fraud detection system comprising first means responsive to a debt account for accessing, in use, the database for selecting a customer account, for obtaining a
30 group of called numbers associated with the debt account and a group of called numbers associated with the selected customer account, for comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a
35 predetermined criterion, providing an indication that the selected customer account is a probable fraudulent-application account.

Preferably, the first means, in use, selects customer accounts sequentially from the database and thereby performs such comparisons in respect of the debt account and each of the customer accounts in the database, in turn.

5 A detection system of the first aspect may further comprise second means for accessing, in use, the database and for producing a list of debt accounts, and wherein the first means, in use, performs comparisons in respect of said selected customer account and each of the debt
10 accounts in said list, in turn.

According to a second aspect of the present invention there is provided a fraud detection system for use with a communications network, the network including a billing system comprising a database of customer account
15 information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a settable indicator which when set indicates that the account is a debt account having a predetermined debt
20 status; the fraud detection system comprising first means for accessing, in use, the database and producing a list of debt accounts, second means responsive to a debt account of said list for accessing, in use, the database and obtaining a customer account whose address matches that of the debt
25 account, such a customer account being referred to herein as a matched customer account, and third means for obtaining a group of called numbers associated with the debt account, for obtaining a group of called numbers associated with a selected customer account, for comparing
30 the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the selected customer account is a probable fraudulent-application account.

35 Preferably the second means of this second aspect, in use, produces a list of matched customer accounts

corresponding to the list of debt accounts and the third means compares, in turn, the respective groups of called numbers associated with the matched customer accounts in the list with the respective groups of called numbers associated with the debt accounts corresponding to the matched customer accounts.

A customer account may preferably be selected only if it is not a debt account.

A fraud detection system in accordance with either of the two aspects of the present invention may comprise means responsive to receipt of an indication of a probable fraudulent-application account for generating for postal despatch a standard letter in accordance with the name and address information of the probable fraudulent-application account.

In a fraud detection system as described above and for use when the customer accounts have a second settable indicator to indicate that the account is a probable fraudulent-application account, and a third settable indicator to indicate that the account is temporarily out of service, preferably the first means or the third means for providing an indication, as the case may be, as well as providing said indication also sets the second indicator of the probable fraudulent-application account, and there is included means responsive to receipt of said indication and to the expiry of a predetermined time interval therefrom to set the third indicator if at said expiry the second indicator is still set.

The predetermined criterion may be that a called number having a predetermined number of occurrences in one of the compared groups of called numbers also has the same number of occurrences in the other compared group.

Alternatively or additionally, the predetermined criterion may be, or include the further requirement, that a set of different called numbers occurring in one of the

compared groups of called numbers also occurs in the other compared group.

According to a third aspect of the present invention there is provided a user location system for use with a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information, the user location system comprising means responsive to a known account associated with a known user for accessing, in use, the database for selecting a customer account, for obtaining a group of called numbers associated with the known account and a group of called numbers associated with the selected customer account, for comparing the respective obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the known user is probably making calls at the address of said selected customer account.

According to a fourth aspect of the present invention there is provided a method of detecting fraudulent use of a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a settable indicator which when set indicates that the account is a debt account having a predetermined debt status; the method comprising the steps of responding to a debt account to access the database, selecting a customer account, obtaining a group of called numbers associated with the debt account and a group of called numbers associated with the selected customer account, comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two

customer accounts meets a predetermined criterion, providing an indication that the selected customer account is a probable fraudulent-application account.

According to a fifth aspect of the present invention

5 there is provided a method of detecting fraudulent use of a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account

10 comprising customer name and address information and a settable indicator which when set indicates that the account is a debt account having a predetermined debt status; the method comprising the steps of accessing the database and producing a list of debt accounts, responding

15 to a debt account of said list to access the database, obtaining a customer account whose address matches that of the debt account, such a customer account being referred to herein as a matched customer account, obtaining a group of called numbers associated with the debt account, obtaining

20 a group of called numbers associated with the matched customer account, comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the

25 matched customer account is a probable fraudulent-application account.

According to a sixth aspect of the present invention there is provided a method of locating a user of a communications network, the network including a billing

30 system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information, the method comprising the steps of responding to a known

35 account associated with a known user to access the database to select a customer account, obtaining a group of called

numbers associated with the known account and a group of called numbers associated with the selected customer account, comparing the respective obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the known user is probably making calls at the address of said selected customer account.

Embodiments of the present invention will now be described by way of example with reference to the drawings in which: -

Figure 1 is a block schematic diagram of a known customer services system for a communications network;

Figure 2 is a block schematic diagram of a known billing system forming part of the customer services system of Figure 1; and

Figure 3 is a block schematic diagram of a fraud detection system of the present invention associated with the billing system of Figure 2.

As can be seen in Figure 1, a billing system is just one of a number of components of an overall customer services system (CSS) forming part of the UK's public switched telephone network (PSTN). The CSS comprises over 50 individual components covering a complete range of customer-facing activities. The most important of these components and their interrelationship is shown in Figure 1, but for the purpose of the present invention, only the billing system 12 will be described further.

A stored program controlled (SPC) exchange (not shown) forming part of the PSTN responds to a customer making a call to send to a call logging store 14 the details of the call, namely, the calling number, the called number, the date, the start time of the call and the finish time of the call.

The billing system 12 processes this information to work out the duration of the call, the distance to the

called number, and the charge band appropriate to the time of day and produce a call charge. The charge details are then stored in a customer account store 16 against the calling number and when the customer's telephone bill is prepared, the set of call details and charges stored against that calling number is retrieved to be printed and sent to the customer in accordance with the name and address entered in the customer account store against the calling number.

Under a debt management component or sub-system 18 of the billing system 12, shown in Figure 2, a customer is sent a first reminder several weeks after the despatch of a statement of account. After several more weeks a second reminder is sent, and it could well be the end of the following accounting period before any positive action is taken by the network operator (accounts personnel) in respect of overdue payment. For further details of the billing system 12 and the CSS 10, the reader may wish to refer to the above mentioned article in British Telecommunications Engineering.

Under the known CSS 10 and billing system 12 as shown in Figures 1 and 2, the debt management sub-system 18 can be processing an overdue payment of a bill for a considerable number of weeks before a decision is taken by the network operator to recover the debt. In the meantime the customer could dishonestly apply for telephone service (declaring that he has no outstanding debt with the network operator). The dishonest customer might apply in a different name at the same address, and if he did so at the end of the accounting period for which the bill is outstanding then the amount of call charges on the new account the subject of a fraudulent application could be very large indeed by the time the fraud was detected. Such a fraud not only deprives the network operator of revenue but can also incur charges in the case of international calls made on the fraudulent-application account.

The dishonest customer who could be an individual or a company, may deliberately change address to avoid detection as well as changing name.

The present invention relates to determining that one
5 customer is the same person as another customer on the basis of the similarity of their calling characteristics. This is principally of use to communications network operators so as to identify at an early stage if a new customer account has been obtained by fraudulent
10 application and that it is therefore likely that the bill on that account will not be paid.

A fraud detection system of the present invention can identify a probable fraud customer even though at a different address and using a different name from that of
15 an existing debt account. The same principle could be used to locate a person for purposes other than fraud limitation on the basis of a known calling characteristic of that person.

In one embodiment, (Figures 2 and 3) the debt
20 management sub-system 18 of the billing system 12 sets a settable indicator, or flag, in the customer account automatically upon the expiry of twenty one days from the despatch of the customer's bill if payment has not been received by that time. The account is now referred to as
25 a debt account and a process initiated for despatch of reminder letters of increasing severity. Thus, as used herein, the term "debt account" means an account which has a predetermined debt status indicated by its flag being set.

30 When payment is received on a debt account, accounts personnel will normally reset the debt indicator. Further indicators are also used to indicate various stages of debt management as mentioned later.

In Figure 3, a debt account file manager 20 accesses
35 each of the accounts in the customer account store 16 in turn, and if an account has a set indicator, the manager 20

adds certain account details to a file (or list) called a debt account file 22. These details will be sufficient to identify the account and to enable the installation address to be matched with the installation address of a new customer account at the same address. For an individual person, the installation address will probably be the customer address, but this will not necessarily be the case for a company having several instruments which are not at the same physical address.

10 The file manager 20 takes about 3 hours to access approximately 2 million customer accounts held in a regional billing system. Once the file manager 20 has been run initially and file 22 has been created it is only necessary to check a list of amendments made to the customer accounts to top-up the file. This topping-up is done daily.

It will be appreciated that not only are new debt accounts added to the file 22 but also old debt accounts which have had their indicator reset will be deleted from the file.

20 The file manager 20 accesses file 22 and in response to the debt accounts therein retrieves the itemised call details for the ultimate and penultimate bills from the call logging store 14 and writes these into an itemised call file 34. The daily topping-up performed by the file manager 20 keeps the itemised call file 34 up to date.

25 The file manager 20 accesses the debt account file 22 and obtains the installation address details of the first entry in the file. From these the file manager 20 accesses the customer account store 16 and looks for an account having the same installation address. Such an account is referred to herein as a possible fraudulent-application account (POSS, for convenience). The file manager 20 writes the corresponding address details into a matched address file 32.

- 10 -

When the file manager 20 has checked all accounts in the customer account store 16, a debt account comparator 24 now accesses the matched account file 32 and for each POSS in turn accesses the itemised call file 34 for the debt account and the customer account store 16 for the POSS to
5 retrieve the respective called number information from the itemised accounts for the last two accounting periods of the debt account, and for the last four weeks of the POSS. Ideally, the comparator will be operative daily so as to
10 identify probable fraudulent application accounts (referred to herein as PROB, for convenience) as soon as possible. The comparator 24 checks to see if the calling characteristics of the POSS are the same as those of the debt account having the same installation address in
15 accordance with a predetermined criterion.

The comparator 24 provides an output signal (indication) 26 if both accounts have ten calls made (logged) to the same called number. If this requirement is not satisfied, the comparator 24 next checks whether there
20 exists in each of the retrieved itemised accounts a set of the same five different called numbers, and provides the output signal 26 if this requirement is satisfied. The comparator also sets a settable indicator in the new customer account to indicate that this is a PROB. The
25 output signal 26 is indicative that the new account is a PROB and is fed to an automatic letter generator 28 which responds by printing a letter for despatch by postal service to the customer of the PROB. Such a letter would make reference to the similarity of the PROB to the debt
30 account and invite the customer to provide an explanation.

A deadline circuit 30 is responsive to the date of issue of the letter despatched by the automatic letter generator 28 and checks to see whether a predetermined deadline, for example 21 days from this date of issue, has
35 expired without the network operator having reset the indicator which indicates that the account was a PROB. In

- 11 -

this event, the deadline circuit 30 will be operative to set the first of a set of flags associated with the management of such an account. These flags indicate, inter alia, that a reply has been received, that a request for a deposit has been made, that a reply to that request has been received, and that the account is temporarily out of service (TOS). In the absence of receipt of a satisfactory explanation by a given date, the network operator could suspend service to the customer.

10 In greater detail, the debt account file manager 20 is constituted by a suite of programs, and comprises a first program which identifies all debt accounts in the customer account store 16 by means of the associated indicator in the customer account record known as CUST-AC. For each
15 debt account found an entry is made in the debt account file 22 comprising certain elements of the installation address to be used to match with a new customer at the same address.

 The suite also comprises a second program which uses
20 the debt account file 22 to find those addresses in the customer account store 16 which have current service, and store them in a matched address file 32. The addresses of current and debt accounts are matched using certain elements of the address (e.g. postcode, thoroughfare ID,
25 premises and sub-premises number).

 The suite also comprises a third program which creates a file 34 of all itemised calls on the last two bills of the debt accounts. This file will be used for comparison against the call logging information of the current
30 customer at that address.

 The above three programs are associated with a fourth, "top-up" program which is run daily on the daily amendments made to the database and thereby makes corresponding amendments to the debt account file 22, the matched address
35 file 32, and the itemised call file 34.

The suite also comprises a fifth program which checks all accounts stored in the matched address file 32 against the call logging store 14 to identify those current account holders at debt account addresses which have made calls in the last week; and a sixth program responsive to the output of the fifth program to get all calls made in the last four weeks by the identified current account holders.

The debt account comparator 24 comprises a program which compares the output of the third and sixth programs to identify numbers called by the debt account and the current account at the same address, and also a program which identifies those customers who have a common call pattern (or characteristic) which is either ten or more calls to the same number, or calls made to five or more different numbers by the two customers.

If desired, the fifth program need not be used, and the sixth program can operate for all current account holders in the matched address file 32.

The abovementioned second, third, and sixth programs together with the debt account comparator 24 constitute a first means of the first aspect of the present invention, and the first program constitutes a second means of the first aspect of the present invention.

The first program also constitutes a first means of the second aspect of the present invention. The second program constitutes a second means of this second aspect, and the third and sixth programs together with the debt account comparator 24 constitute the third means of this second aspect.

In the embodiment of Figure 3, the debt account comparator 24 compares installation address details of the first entry in the file 22 with all the entries in the customer account store 16, except those already having a set debt account indicator, and then proceeds to repeat the process for the next entry in the file 22, and so on. In an alternative, not shown, the comparator 24 compares the

first entry of the customer account store 16 with all the entries in the file 22 and then repeats the process for the next entry in the customer account store 16, and so on.

The embodiments described above are based on the
5 concept of a fraudulent application for telephone services being made by the bad debt customer in a different name but at the same address. An alternative embodiment is based on the concept that a bad debt customer has moved to a new address and applies for telephone service in a different
10 name.

In this latter embodiment, a debt account file manager
20 creates a debt account file 22, and an itemised call file 34 as in the above embodiments, and a debt account comparator 24 checks the calling characteristics of a debt
15 account with those of each of the customer accounts, except those already identified as debt accounts.

As before, this embodiment checks all the customer accounts against the first debt account, and then against the second, and so on, and in an alternative embodiment,
20 not shown, the first customer account is checked against each debt account, then the second customer account is so checked, and so on.

It will be appreciated that the above mentioned comparison processes will ignore for characteristic
25 matching purposes certain called numbers, for example, 123 (speaking clock), for which there could be a legitimate reason why both accounts contain these called numbers.

Whereas in the above described embodiments, the called number information for a debt account is retrieved from the
30 customer account store 16 by the file manager 20 and stored in the itemised call file 34, it will be appreciated that the comparator 24 may be responsive to a debt account to retrieve such itemised call information directly from the customer account store 16.

35 Furthermore, whereas the comparator 24 does two comparisons in sequence, it will be appreciated that the

calling characteristics can be compared on the basis of the first comparison only, or of the second comparison only. Furthermore, a PROB could be indicated only if both comparisons give a positive result.

5 The abovementioned UK PSTN comprises an interconnected network of SPC exchanges. This is not essential to the present invention which may be embodied in other forms of communications network, for example, a network based on passive optical network technology.

10 The customer account details, for example, name, address, and various flags concerned with account management may be held in a store which is physically separate from that for holding the call logging details. Alternatively all the information may be in one large
15 store. The particular arrangement of storing and accessing the information is not important, and the collective stores of such billing account information is referred to herein as a database of customer account information and of account-associated call logging information. Such as
20 database may be a regional database, or one for the whole network, and may be centrally located in the region or national network, or distributed.

CLAIMS

1. A fraud detection system for use with a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a settable indicator which when set indicates that the account is a debt account having a predetermined debt status the fraud detection system comprising first means responsive to a debt account for accessing, in use, the database for selecting a customer account, for obtaining a group of called numbers associated with the debt account and a group of called numbers associated with the selected customer account, for comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the selected customer account is a probable fraudulent-application account.
2. A fraud detection system as claimed in Claim 1, where said first means, in use, selects customer accounts sequentially from the database and thereby performs such comparisons in respect of the debt account and each of the customer accounts in the database, in turn.
3. A fraud detection system as claimed in Claim 1, further comprising second means for accessing, in use, the database and for producing a list of debt accounts, and wherein the first means, in use, performs comparisons in respect of said selected customer account and each of the debt accounts in said list, in turn.
4. A fraud detection system for use with a communications network, the network including a billing system comprising

a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a settable indicator which when set
5 indicates that the account has a predetermined debt status, an account having its indicator set is referred to herein as a debt account; the fraud detection system comprising first means for accessing, in use, the database and producing a list of debt accounts, second means responsive
10 to a debt account of said list for accessing, in use, the database and obtaining a customer account whose address matches that of the debt account, such a customer account being referred to herein as a matched customer account, and third means for obtaining a group of called numbers
15 associated with the debt account, for obtaining a group of called numbers associated with the matched customer account, for comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a
20 predetermined criterion, providing an indication that the matched customer account is a probable fraudulent-application account.

5. A fraud detection system as claimed in Claim 4, wherein the second means, in use, produces a list of
25 matched customer accounts corresponding to the list of debt accounts, and the third means compares, in turn, the respective groups of called numbers associated with the matched customer accounts in the list with the respective groups of called numbers associated with the debt accounts
30 corresponding to the matched customer accounts.

6. A fraud detection system as claimed in any one of the preceding claims, wherein a customer account is selected only if it is not a debt account.

7. A fraud detection system as claimed in any one of the preceding claims further comprising means responsive to an indication of a probable fraudulent-application account for generating for postal despatch a standard letter in accordance with the name and address information of the probable fraudulent-application account.

8. A fraud detection system as claimed in any one of the preceding claims, for use when the customer accounts have a second settable indicator to indicate that the account is a probable fraudulent-application account, and a third settable indicator to indicate that the account is temporarily out of service, and wherein the first means or the third means for providing an indication, as the case may be, as well as providing said indication also sets the second indicator of the probable fraudulent-application account, and further including means responsive to receipt of said indication and to the expiry of a predetermined time interval therefrom to set the third indicator if at said expiry the second indicator is still set.

9. A fraud detection system as claimed in any one of the preceding claims, wherein the predetermined criterion is that a called number having a predetermined number of occurrences in one of the compared groups of called numbers also has the same number of occurrences in the other compared group.

10. A fraud detection system as claimed in any one of the preceding claims, wherein the predetermined criterion solely, or additionally, as the case may be, requires that a set of different called numbers occurring in one of the compared groups of called numbers also occurs in the other compared group.

11. A user location system for use with a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called
5 numbers, each customer account comprising customer name and address information, the user location system comprising means responsive to a known account associated with a known user for accessing, in use, the database for selecting a customer account, for obtaining a group of called numbers
10 associated with the known account and a group of called numbers associated with the selected customer account, for comparing the respective obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion,
15 providing an indication that the known user is probably making calls at the address of said selected customer account.

12. A method of detecting fraudulent use of a communications network, the network including a billing
20 system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account comprising customer name and address information and a settable indicator which when set indicates that the
25 account is a debt account having a predetermined debt status; the method comprising the steps of responding to a debt account to access the database, selecting a customer account, obtaining a group of called numbers associated with the debt account and a group of called numbers
30 associated with the selected customer account, comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the selected customer account
35 is a probable fraudulent-application account.

- 19 -

13. A method as claimed in Claim 12, including selecting customer accounts sequentially from the database and performing such comparisons in respect of the debt account and each of the customer accounts in the database, in turn.

5 14. A method as claimed in Claim 12, including accessing the database, producing a list of debt accounts, and performing comparisons in respect of said selected customer account and each of the debt accounts in said list, in turn.

10 15. A method of detecting fraudulent use of a communications network, the network including a billing system comprising a database of customer account information and of account-associated call logging information including called numbers, each customer account
15 comprising customer name and address information and a settable indicator which when set indicates that the account is a debt account having a predetermined debt status; the method comprising the steps of accessing the database and producing a list of debt accounts, responding
20 to a debt account of said list to access the database, obtaining a customer account whose address matches that of the debt account, such a customer account being referred to herein as a matched customer account, obtaining a group of called numbers associated with the debt account, obtaining
25 a group of called numbers associated with the matched customer account, comparing the respectively obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets a predetermined criterion, providing an indication that the
30 matched customer account is a probable fraudulent-application account.

16. A method as claimed in Claim 15, including producing a list of matched customer accounts corresponding to the

list of debt accounts, and comparing, in turn, the respective groups of called numbers associated with the matched customer accounts in the list with the respective groups of called numbers associated with the debt accounts
5 corresponding to the matched customer accounts.

17. A method as claimed in any one of Claims 12 to 16 including selecting a customer account only if it is not a debt account.

18. A method as claimed in any one of Claims 12 to 17,
10 including responding to an indication of a probable fraudulent-application account to generate for postal despatch a standard letter in accordance with the name and address information of the probable fraudulent-application account.

15 19. A method as claimed in any one of Claims 12 to 18, including providing respective second settable indicators to indicate that an account is a probable fraudulent-application account, and respective third settable
20 indicators to indicate that an account is temporarily out of service, and further including, as well as providing said indication, also setting the second indicator of the probable fraudulent-application account, and responding to receipt of said indication and to the expiry of a
25 predetermined time interval therefrom to set the third indicator if at said expiry the second indicator is still set.

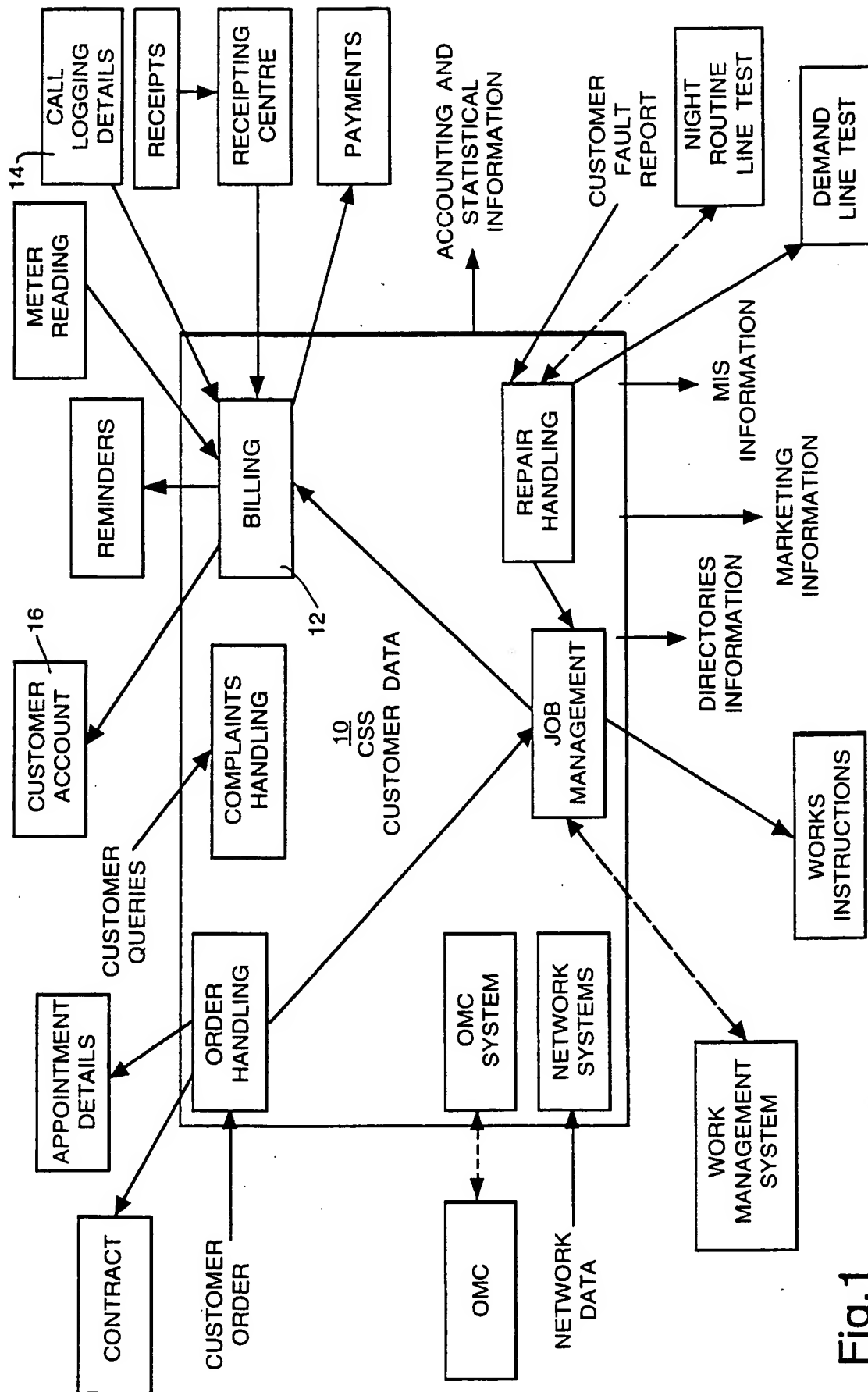
20. A method as claimed in any one of Claims 12 to 19, wherein the predetermined criterion is that a called number having a predetermined number of occurrences in one of the
30 compared groups of called numbers also has the same number of occurrences in the other compared group.

- 21 -

21. A method as claimed in any one of Claims 12 to 20, wherein the predetermined criterion solely, or additionally, as the case may be, requires that a set of different called numbers occurring in one of the compared
5 groups of called numbers also occurs in the other compared group.

22. A method of locating a user of a communications network, the network including a billing system comprising a database of customer account information and of account-
10 associated call logging information including called numbers, each customer account comprising customer name and address information, the method comprising the steps of responding to a known account associated with a known user to access the database to select a customer account,
15 obtaining a group of called numbers associated with the known account and a group of called numbers associated with the selected customer account, comparing the respective obtained groups and, if the degree of similarity of the calling characteristics of the two customer accounts meets
20 a predetermined criterion, providing an indication that the known user is probably making calls at the address of said selected customer account.

1 / 3



OMC: OPERATIONS AND MAINTENANCE CENTRE

Fig.1

2 / 3

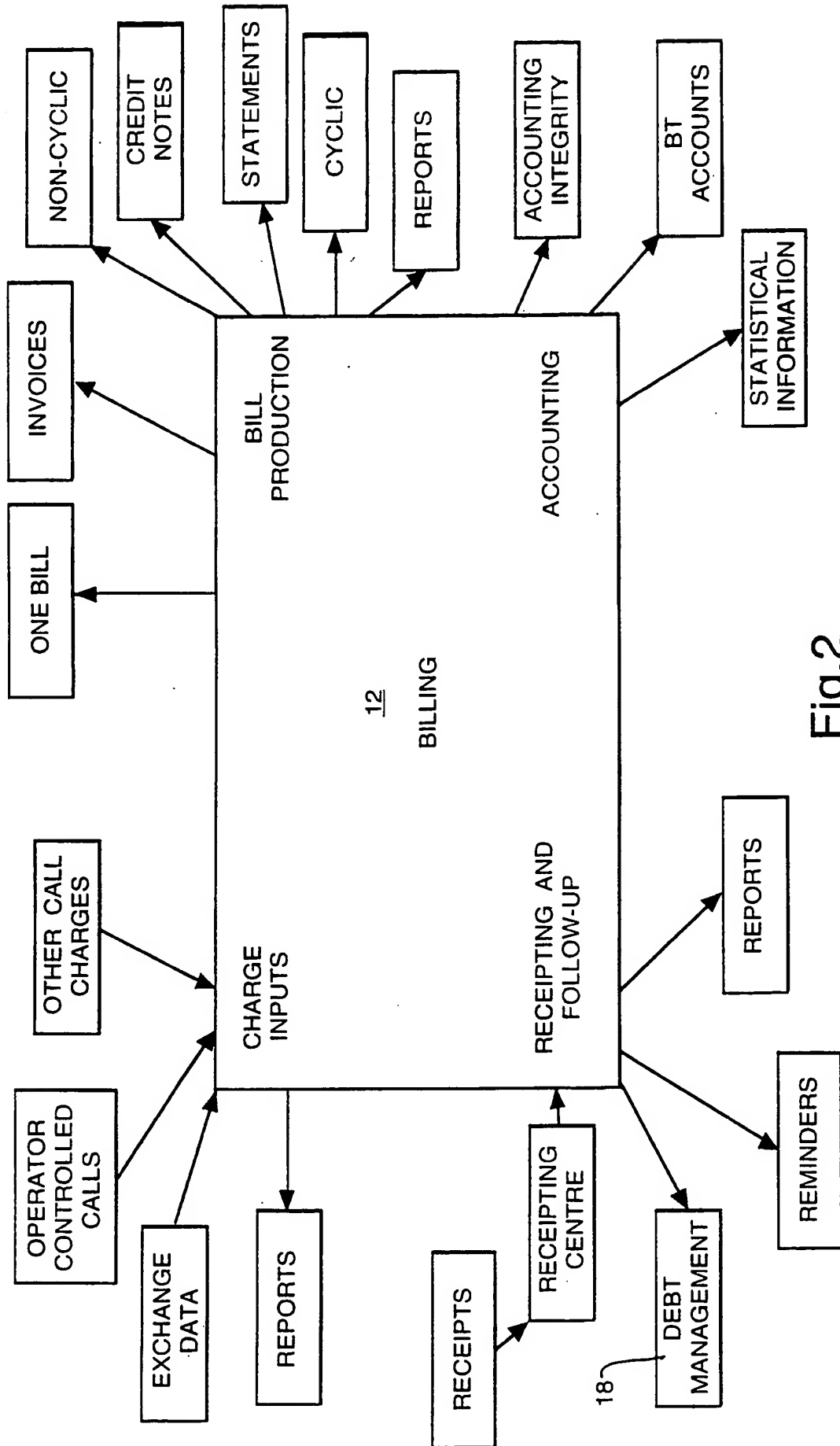
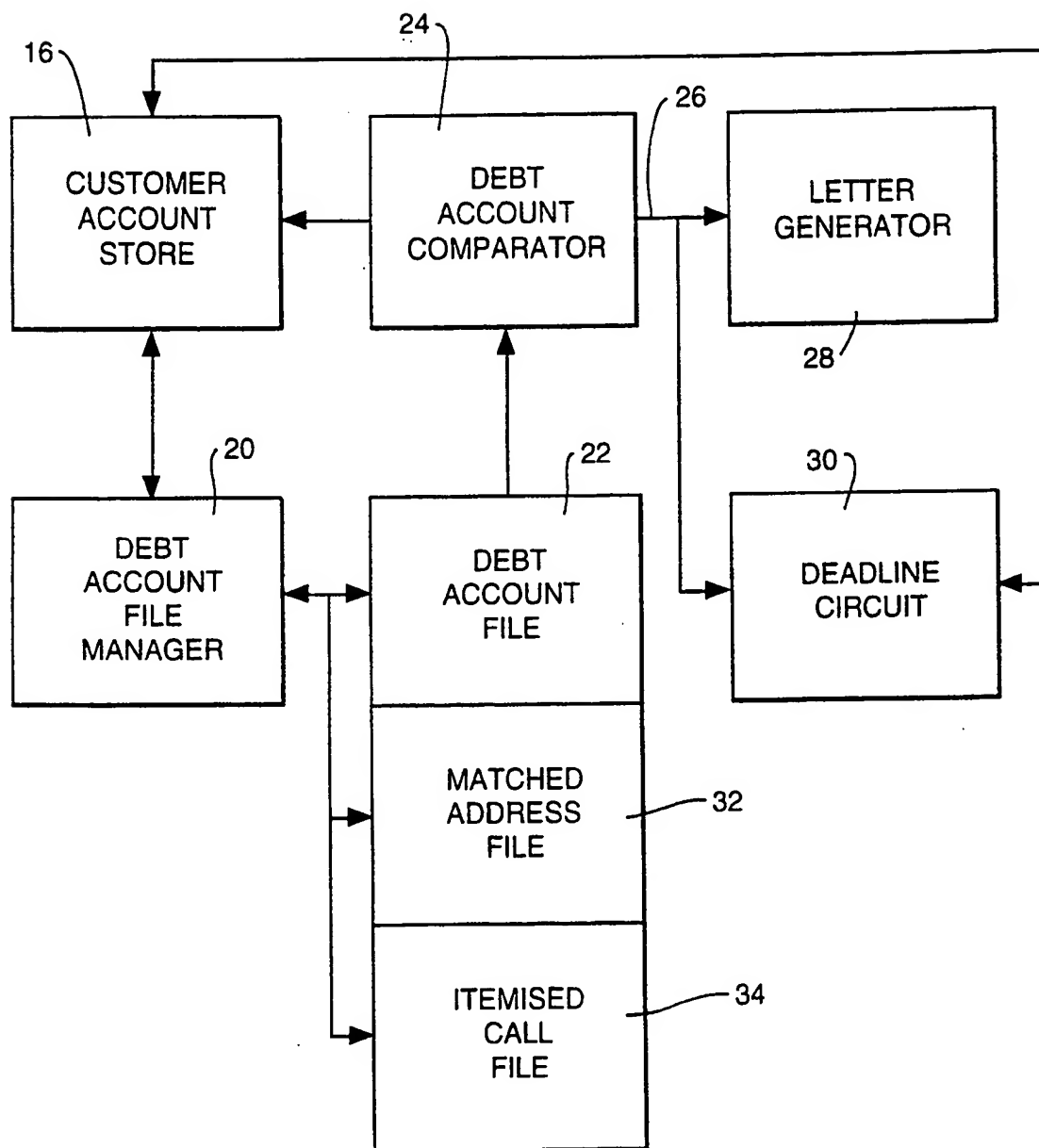


Fig.2

3/3

Fig.3



A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 H04M15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 212 654 (AT&T) 4 March 1987 see abstract ---	1-22
Y	TENCON '89 - FOURTH IEEE REGION 10 INTERNATIONAL CONFERENCE, 22 November 1989, BOMBAY, INDIA pages 593 - 599, XP203943 I.BENYACAR ET AL. 'Concepts in Recording of Services' see page 594, line 31 - line 39 see paragraph 6.1 ---	1-22
P,X	EP,A,0 583 135 (AT&T) 16 February 1994 see the whole document --- -/--	1-22



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

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* & * document member of the same patent family

Date of the actual completion of the international search

6 July 1994

Date of mailing of the international search report

21.07.94

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AT&T TECHNICAL JOURNAL, vol.66, no.3, May 1987, SHORT HILLS, NJ - USA pages 73 - 81 E.J.OBUCHOWSKI 'Access Charge and Revenue Architecture' see the whole document -----	1-22

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		DE-D- 3689214	02-12-93
		DE-T- 3689214	11-05-94
		JP-A- 62053554	09-03-87
		US-A- 4756020	05-07-88

EP-A-0583135	16-02-94	CA-A- 2100846	13-02-94
